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1 RECORD OF ORAL HEARING
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3 UNITED STATES PATENT AND TRADEMARK OFFICE
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6 BEFORE THE BOARD OF PATENT APPEALS
7 AND INTERFERENCES
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10 *Ex parte* MASAYUKI KAMON, and EIICHI YAGI
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13 Appeal 2009-005958
14 Application 10/689,995
15 Technology Center 3600
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18 Oral Hearing Held: June 23, 2010
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21 Before JOHN C. KERINS, STEVEN D.A. McCARTHY, and
22 MICHAEL W. O'NEILL, *Administrative Patent Judges*.
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24 APPEARANCES:

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1 The above-entitled matter came on for hearing on Wednesday, June
2 23, 2010, commencing at 9:20 a.m., at the U.S. Patent and Trademark
3 Office, 600 Dulany Street, Alexandria, Virginia, before Paula Lowery,
4 Notary Public.

5 THE CLERK: Good morning. Calendar Number 69, Appeal No. 2009-
6 005958, Mr. Whitehead.

7 JUDGE KERINS: Mr. Whitehead, this hearing is open to the public. Are
8 any of the people who entered with you the appellant?

9 MR. WHITEHEAD: Yes, Mr. Nogeuchi is from the Appellant.

10 JUDGE KERINS: Mr. Whitehead, we have reviewed the record in the case
11 and are generally familiar with the issues, and we're looking forward to
12 hearing your argument today.

13 MR. WHITEHEAD: Thank you, good morning. I'm Andy Whitehead, and
14 I represent the Appellant in this Appeal.

15 For at least the reasons presented in the Appeal Brief and further discussed
16 here today, we request that the Examiner's rejection be reversed. I'd like to
17 begin with, essentially, a short summary of the claimed subject matter and
18 benefits.

19 JUDGE McCARTHY: Counsel, is there any evidence in the record
20 concerning secondary considerations, such as unexpected results or the like?

21 MR. WHITEHEAD: Regarding unexpected results in the Appeal Brief,
22 there is discussed the tri-axial intersection point and the benefits associated
23 with that tri-axial intersection.

24 JUDGE McCARTHY: And is there any evidence or expert opinion
25 concerning the tri-axial intersection point?

1 MR. WHITEHEAD: There has not been any declaration submitted
2 regarding the tri-axial intersection.

3 JUDGE McCARTHY: Is there any comparative evidence in the
4 specification that would bear on the results of the tri-axial intersection or any
5 other secondary considerations?

6 MR. WHITEHEAD: Not directly in the specification itself. The tri-axial
7 intersection point is, essentially, a result of the arrangement of links and
8 joints presented in Claim 8.

9 JUDGE McCARTHY: Please proceed.

10 MR. WHITEHEAD: Regarding Claim 8, the sole independent claim
11 pending in the application, it is directed to the articulated manipulator, which
12 is essentially a snake-type robot arm. These types of robot arms are capable
13 of movement essentially by rotating each of the links relative to one another
14 at their respective joints.

15 The particular articulated manipulator of Claim 8 requires a specified
16 arrangement of links and joints that allow it to function in a manner that
17 provides many benefits over ordinary articulated manipulators.

18 For example, the articulated manipulator of Claim 8 is capable of operating
19 in a small or confined, narrow or complicated work site. In doing so, Claim
20 8 requires the first to sixth links arranged in a series, starting from a base.

21 Connecting each of the adjacent joints and the base are a plurality of joints.

22 The joints are one of two types. There are coaxial joints, which rotate
23 around an axis that is coaxial with the links it's connected to. Coaxial joints
24 are shown, for example, in Figure 1 as references D-1 and D-5.

1 There are also diagonal-type of joints, which are inclined at an angle relative
2 to the axis of the link it is attached to. Diagonal joints are represented as D-
3 2, D-3, D-4 and D-6 in Figure 1.

4 JUDGE McCARTHY: Counsel, are joints other than coaxial or angled at 45
5 degrees known in the industry?

6 MR. WHITEHEAD: Yes. The joints could be of any particular angle.
7 Essentially, though, there are only the two types of joints, being coaxial or
8 diagonal joints. However, there would be essentially any number of angles
9 at which they could be disposed at.

10 JUDGE McCARTHY: So in other words, we're not talking about just a
11 finite set of linkages that could be coaxial -- could be 45 but nothing else?

12 MR. WHITEHEAD: Correct. It could be any given angle, especially in the
13 order of the angles could differ. However, each adjacent joint, obviously,
14 has to be at the same angle to the adjacent joint.

15 JUDGE McCARTHY: Is the use of six linkages -- I believe it's six linkages
16 -- standard in the industry?

17 MR. WHITEHEAD: Not necessarily. In fact, depending on the length,
18 complexity of movement involved, many combinations of links and joints
19 could exist. Essentially, an infinite number.

20 You could imagine these robot arms extending for many different links.
21 There's, essentially, no limit.

22 JUDGE O'NEILL: Wouldn't the number be dependent upon the desired
23 results that the inventor or manufacturer is trying to achieve? Even though it
24 is numerous, wouldn't one of ordinary skill in the art be able to understand
25 how many links they need?

1 MR. WHITEHEAD: Well, the difference is in the operation. So the more
2 links you have, the more complicated the control becomes of the robot.
3 So there's other aspects when considering the application other than just the
4 number of links. So why a particular range of movement may be desired,
5 one would have to consider more than just the number of joints in doing so.
6 Just to get a particular range of motion, it wouldn't necessarily be well
7 known to just say six joints would be necessary or seven joints would be
8 necessary. There would, essentially, have to be research done to figure out
9 exactly the capability of the arrangement of the links and joints that are put
10 together.

11 JUDGE O'NEILL: Well, that begs the question what do you feel -- what's
12 your position with the level of ordinary skill in this art? Is it low? Is it
13 high?

14 MR. WHITEHEAD: Well, I think the level of skill in the art here, we're
15 talking about engineers. We're talking about an educated group of inventors.
16 Now, depending on the complexity of movement that is needed, I think the
17 range of skill in the art varies.

18 This isn't just a matter of sticking links and joints together and having a
19 robot that works. There's also a lot of computer control and knowledge that
20 goes into figuring out the exact location of where this robot is when it's
21 attempting to be controlled.

22 So I would say the skill would be relatively high meaning education as
23 engineers.

24 JUDGE McCARTHY: Is there anything in Takagi which would allow us to
25 get a fix on what the ordinary level of skill in the art is?

1 MR. WHITEHEAD: I don't think Takagi itself does. The translation we
2 have is very brief, and essentially it more or less shows a particular
3 arrangement of links and joints given its operation. There's not a lot of
4 discussion as to the level of skill presented.

5 JUDGE O'NEILL: Well, you have said to us that the level of skill is high,
6 and the objective would be well known on where you're trying to reach, why
7 couldn't one of ordinary skill in the art know that these links exist? That
8 hasn't been contested.

9 Why wouldn't one of ordinary skill in the art be able to arrange them as they
10 see fit in order to achieve the objective result?

11 MR. WHITEHEAD: It's definitely well known that the links and joints
12 exist. On their face I think the links and joints are simple objects. However,
13 the number of links, number of joints, the angles they're attached at and the
14 relative arrangement of those are what really determine the functionality and
15 complexity of controlling that robot and its associated range of motion.
16 So although these individual parts may be well known, the arrangement
17 could be taken from an infinite number of possibilities.

18 JUDGE O'NEILL: Well, you might have a numerous number of
19 possibilities, but what's unpredictable? The objective is predictable, is it
20 not?

21 MR. WHITEHEAD: Not necessarily, because changing one angle, one
22 joint, or the location of one of the joints, changes the range of motion and
23 the control of that robot itself.

24 So it's not simply a matter of saying, you know, I need a robot to do this and
25 it's a simple calculation to put these links and joints together to get that.

1 There is skill involved in knowing which links and joints, and testing these
2 configurations to figure out what will work. What will give you that range
3 of motion? What will reduce the amount of space required to have this robot
4 operate? What will reduce the complexity of control in operating the robot.
5 Those are all considerations that are not just easy to come by.

6 JUDGE O'NEILL: Well, where in your specification did you go through all
7 of this? The testing that's required to get the movement associated? A
8 review of your specification just basically seems to disclose we have a set of
9 six links with certain diagonal joints, certain coaxial joints, and we've
10 arranged them in this way.

11 MR. WHITEHEAD: Right, the particular arrangement of the links and
12 joints is described in the specification. In the specification it is discussed
13 that the links and joints do affect the complexity of control.
14 Right now I'm not able to point to a particular location in the specification
15 that has that on the spot right now.

16 JUDGE McCARTHY: Counsel, if I understand correctly, the design
17 parameters you're talking about are the complexity of control, things like the
18 position and range of motion you require, presumably the ability to get to the
19 location you're trying to perform a weld or some other function at.
20 Aren't these all parameters an ordinary engineer would be familiar with?

21 MR. WHITEHEAD: I think the parameters themselves may be. I think the
22 difficulty comes in in figuring out the arrangements that will operate as
23 intended.

24 It's not exactly predictable to take any given number of links and joints, any
25 given number of possible angles at which they could be disposed at, and
26 where to place these links and joints.

1 JUDGE McCARTHY: But couldn't you determine what the ultimate range
2 or path of movement of the end of the structure with a computer model?

3 MR. WHITEHEAD: I imagine once you had a particular arrangement in
4 mind, you would be able to plug that into a computer model to, you know,
5 essentially figure out what the range of motion would be. But that would be
6 only after coming up with the arrangement itself.

7 JUDGE KERINS: Along those lines, Counsel, Figure 1 of Takagi appears
8 to have six links.

9 MR. WHITEHEAD: Correct.

10 JUDGE KERINS: It appears to only have one joint that differs from what
11 you have in your claims. One of the angled joints, maybe the fourth or fifth
12 link, is angled instead of coaxial. Wouldn't a person of ordinary skill in the
13 art be able to take Figure 1 and comprehend its range of motion, and then
14 say that's not exactly what I want and work from that to maybe change one
15 of the angle joints to a coaxial joint?

16 MR. WHITEHEAD: I think there has to be some reason or rationale for
17 somebody to do that. Looking at Takagi, you know, from what is shown
18 here the range of motion is not necessarily given in Takagi.

19 So essentially what somebody would have to do is take Takagi, figure out
20 what its range of motion was, determine that it isn't suitable for what they
21 need, and then determine that some set out of an infinite number of
22 possibilities would give that range of motion they need.

23 I don't think it would be obvious to come to the specific arrangement of
24 Claim 8 just from looking at this. In Takagi itself, although there's six links
25 shown, as you can see all of the intermediate joints are all angled.

1 It's not until they've added additional joints to increase the range of motion
2 where they even add any coaxial joints.

3 JUDGE O'NEILL: Wouldn't a person of ordinary skill in the art say, if I
4 need to extend or change the range of motion of Takagi, I should maybe add
5 some coaxial joints?

6 MR. WHITEHEAD: I think it's somewhat unpredictable the result that
7 you're going to get in saying, well, what if I swap out this joint for a coaxial
8 joint? What if I swap out this joint for a coaxial joint?

9 JUDGE O'NEILL: Well, for unpredictability you need to have some sort of
10 evidence that it's unpredictable. Do you have anything in the record here
11 that says that these -- the results are unpredictable? This doesn't appear to be
12 a chemistry case.

13 MR. WHITEHEAD: Right, it's not a chemistry case, but it is a case dealing
14 with, essentially, in infinite number of possible combinations of links and
15 joints and their positions.

16 JUDGE O'NEILL: I beg to differ with you on that. I believe the Examiner
17 challenged your position that it's infinite.

18 That it's finite based on there are a certain number of straight, a certain
19 number of angles, and one of ordinary skill in the art, which does seem
20 reasonable, could not mesh a straight with an angle. So, therefore, there
21 might be a large number, but I think infinite is a mischaracterization.

22 MR. WHITEHEAD: I think it is close to infinite. You do have coaxial
23 joints which would be 180 degrees --

24 JUDGE O'NEILL: Well, that's your argument that it's infinite. Have you
25 provided any data to say that it's infinite? Do we have any evidence of that?

26 MR. WHITEHEAD: I think it's a simple mathematical calculation that there

1 is 180 degree possibility that these angles could be disposed at, and any
2 number could fall in that range. We're not limited to simply zero degrees, 1
3 degree, 2 degrees. It could be any within that range.

4 The particular arrangement of Claim 8 uses 45 degree angles in specified
5 locations relative to one another to produce a particular result. In the art if
6 somebody is just looking -- starting from Takagi or any other robot arm, all
7 you're really given is it's known that links and joints exist.

8 Simply knowing that links and joints exist does not, you know, provide
9 sufficient data for one to come to a specific arrangement or the unexpected
10 results that we discuss in Claim 8.

11 JUDGE O'NEILL: Well, you just said unexpected results in Claim 8. What
12 are the unexpected results of Claim 8?

13 MR. WHITEHEAD: The unexpected results being the tri-axial intersection
14 point which is the specific combination of the links and joints that creates
15 the point among the coaxial joint of the fourth and fifth links, the diagonal
16 joint between fifth and six link, and the terminal portion of the sixth link.

17 Essentially, it would be an intersecting line from each of those positions to
18 come up with the point.

19 What this allows is an ease of control of the robot arm being that you'd have
20 to track that point as opposed to doing the inverse conversion from each
21 rotation of the joints to figure out where the terminal portion is in space.

22 JUDGE O'NEILL; But the claim is just directed to a manipulator. I don't
23 see anything about computer control or the tri-axial intersection point.

24 Maybe we've overlooked something in your specification that is directed to
25 this point and the control system associated in order to develop an arm to get
26 to this point.

1 What I'm seeing in your claim is a basic set of links and set of joints.

2 MR. WHITEHEAD: Right, the structure is what is claimed in Claim 8. A
3 specified arrangement of links and joints and their orientations.

4 JUDGE O'NEILL: I guess that goes back to the ultimate question. Why is
5 the arrangement -- why is the arrangement, while the Examiner has
6 acknowledged that it's different, why does the difference carry you to the
7 realm of nonobviousness?

8 MR. WHITEHEAD: I think the Examiner's broad allegation that because
9 links and joints are known, that any combination of links and joints in a
10 robot arm is obvious is simply too broad and incorrect.

11 JUDGE O'NEILL: Well, that's what the Examiner said in the actual ground
12 of rejection, but in responding to your argument the Examiner said that -- he
13 came up with a rationale that a person of ordinary skill in the art would in
14 designing a robot for a particular purpose arrange the links in such a way
15 that the desired end result is achieved.

16 So how do you respond to that point?

17 MR. WHITEHEAD: I think what's required is some reason or rationale to
18 come to this specified arrangement of links and joints that's being claimed.
19 Specifically, six links, coaxial joint between the base and first link, another
20 coaxial joint between the fourth and fifth link, and specified 45 degree angle
21 for all of the other joints.

22 There's nothing in Takagi that would say we need to improve or change the
23 relative motion and range of motion of the robot arm to insert these coaxial
24 joints at the base and first link between the fourth and fifth link and maintain
25 45 degrees between the others at these altering angles.

1 From our perspective in Takagi it appears they recommend adding joints,
2 especially if you're going to add another coaxial joint. The Figure 5 is the
3 only reference given that shows the addition of an additional coaxial joint,
4 but in doing so, they also have added several additional links.

5 So there's no reason or rationale presented that would lead one of ordinary
6 skill in the art to come to the particular arrangement of Claim 8.

7 JUDGE McCARTHY: Counsel, if I understand correctly, going to I believe
8 it's Figure 1 of Takagi, doesn't the first three linkages there line up with the
9 first three linkages recited in the claim?

10 MR. WHITEHEAD: Well --

11 JUDGE McCARTHY: So, in fact, we're talking about a change in merely
12 the last three degrees of freedom of the device?

13 MR. WHITEHEAD: Well, there'd be the addition of the second coaxial
14 joint between the fourth and fifth link, which is not shown in Takagi.

15 JUDGE McCARTHY: But we're talking about a change in one degree of
16 freedom, which would then affect the next two degrees of freedom as well.

17 MR. WHITEHEAD: Any change in the angle or position of these joints
18 would change the operation of the Takagi device. It would also require,
19 obviously, new controls and new sets of mathematical equations to
20 determine the location of the terminal point.

21 JUDGE McCARTHY: But, once again, those equations would be derivable
22 by one of ordinary skill in the art. One of ordinary skill in the art could
23 predict how this change would affect the range of motion.

24 MR. WHITEHEAD: I don't necessarily think that they could predict how it

1 would change without testing. So I think it would be an inordinate amount
2 of testing to try to swap out different joints at different positions, do all the
3 testing that would be required to determine --

4 JUDGE McCARTHY: Is there anything in the record that would indicate
5 what sort of testing would be required?

6 MR. WHITEHEAD: Not that I'm aware of, Your Honor.

7 JUDGE KERINS: We're nearly out of time. If you have any concluding
8 remarks --

9 MR. WHITEHEAD: So, essentially, what we'd like to say is there is no
10 reason or rationale presented in Takagi or elsewhere that would lead one of
11 ordinary skill to come to this particular arrangement of links and joints.
12 In addition, the modification of Takagi would have led to a change in its
13 capabilities and complexity of its robot arm, and altering of combinations of
14 Takagi would have required a completely new principle of operation to be
15 derived to calculate its range of motion, which would be different from the
16 Japiskse case the Examiner has cited which involves the mere movement of
17 a switch which didn't change any of the operation of its device.
18 Changing any of the angles, joints, links in Takagi, it would change the
19 operation of its device.

20 So for at least these reasons, we don't believe that Claim 8 would have been
21 obvious over Takagi, and we ask the Board to reverse the rejection.

22 JUDGE KERINS: Any further questions, Judge McCarthy?

23 JUDGE McCARTHY: Is there anything in the record that would indicate
24 that your device of Claim 18 is intended for a different purpose than the
25 device of Figure 1 of Takagi?

1 MR. WHITEHEAD: The intent of the device of the present claim discloses
2 it is intended for use in narrow, complicated work areas, which isn't
3 necessarily the scope of Takagi.

4 JUDGE McCARTHY: And it's your contention that working in narrow
5 areas is something that would not be predictable, or something that would
6 not be looked for by one of ordinary skill?

7 MR. WHITEHEAD: It would solely depend on the purpose of the device.
8 If it was to be used in an open manufacturing environment, no. I think the
9 range of motion and narrow work spaces, things of that nature would not be
10 something they would consider.

11 JUDGE McCARTHY: Thank you.

12 JUDGE KERINS: Judge O'Neill?

13 JUDGE O'NEILL: No.

14 JUDGE KERINS: Thank you very much, Mr. Whitehead. We'll take the
15 case under advisement.

16 MR. WHITEHEAD: Thank you.

17 Whereupon, the proceedings at 9:50 a.m. were concluded.

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